

# Mecheleciv



VOL. 11

MAY 1952

No. 6

TOMPKINS HALL

THE SCHOOL OF ENGINEERING  
GEORGE WASHINGTON UNIVERSITY

Another page for

# YOUR BEARING NOTEBOOK

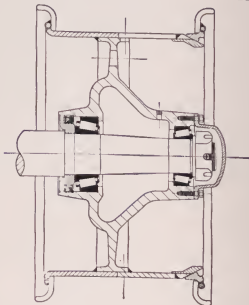


## How to help a scraper do its level best

Bearing applications on large-capacity scraper wheels pose two problems to design engineers. One is the heavy loads. The other is wear. Engineers solve both problems at once by mounting scraper wheels on Timken® tapered roller bearings. Line contact between rollers and races of Timken bearings provides extra load-carrying capacity. The true rolling motion and incredibly smooth surface finish of Timken bearings practically eliminate friction and wear within the bearing.

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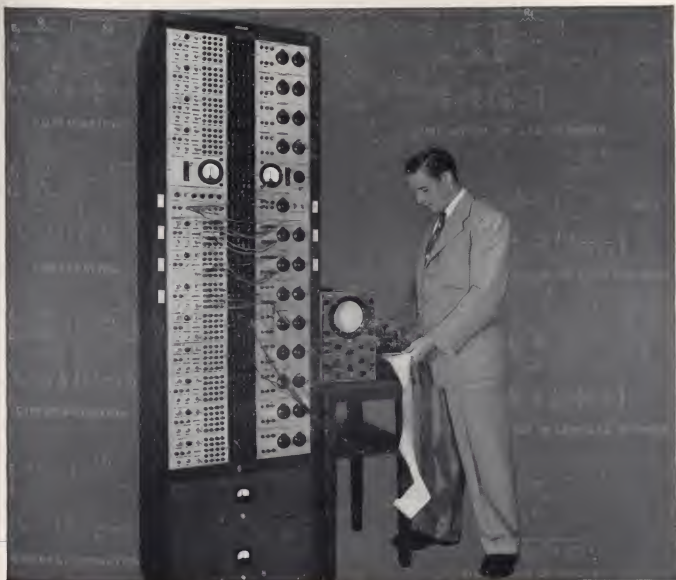
## How you can learn more about bearings

Some of the engineering problems you'll face after graduation will involve bearing applications. If you'd like to learn more about this phase of engineering, we'll be glad to help. For a copy of the 270-page General Information Manual on Timken bearings, write today to The Timken Roller Bearing Company, Canton 6, Ohio. And don't forget to clip this page for future reference.



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NOT JUST A BALL ○ NOT JUST A ROLLER ◯ THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL ⊕ AND THRUST ⊖ LOADS OR ANY COMBINATION ⊕



Solving a dynamics problem with the Boeing Computer; oscilloscope at right shows result.

## What's it like to be a Boeing engineer?

Boeing engineers enjoy many advantages—among them the finest research facilities in the industry. These include such advanced aids as the Boeing-designed, Boeing-built Electronic Analog Computer shown in the picture above.

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you'll work with renowned engineers on such vital projects as guided missiles, the still-classified B-52, the record-shattering six-jet B-47, and other outstanding developments.

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Boeing Airplane Company, Seattle 14, Washington

# **BOEING**



## "They never missed an issue!"

*"Just look at that mess!"*

"That's what a fire, a few axes and a couple tons of water can do to a place. But you've got to give Editor Grimes and the boys a lot of credit . . . *they didn't miss an edition, fire or no fire.*

"They're over in their new home now . . . *still* printing the news, telling the truth and fighting for the people's rights like they've been doing for the last forty-two years.

"I know, when I look at that boarded-up door, the broken windows and the 'closed' sign, it reminds me of how newspapers in some other countries get closed down . . . *for keeps* . . . by governments that hate the idea of free press . . . that can't take criticism . . . that don't believe in free speech.

"Well, that's what happens when government of, by and for the people becomes government of, by and for the government! It's 'Good-bye, Freedom' then . . . and with it go Free Worship, Free Elections, Free Enterprise . . . all those Freedoms that make you glad you're a citizen of *this* country instead of a socialist or communistic one.

"Praise the Lord, we're still a free people over here. We can still choose our own churches, our own friends, our own jobs (like mine at Republic) and our own political parties. We can praise our government for wise decisions or criticize it for reckless spending of taxpayers' hard-earned dollars . . . without fear of secret police or concentration camps.

"But . . . let's not get careless about it. After all, the people in those dictator-plagued countries used to enjoy a lot of these Freedoms. Unfortunately, some of them got careless and handed over their rights, one by one, to governments which promised to 'take care of them.'

"Me . . . I'll take my Freedoms with no 'hand-out' strings attached. How about you, Friend?"

## REPUBLIC STEEL

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**Republic BECAME strong in a strong and free America. Republic can REMAIN strong only in an America that remains strong and free . . .**

**an America whose people, farms, homes and businesses are all enriched by the chemist's magic. And, through the Chemical Industry, Republic serves America. Many tons of carbon, alloy and, especially, stainless steels . . . much of it from Republic's mills . . . are needed each year for chemical vats, work tables, acid tanks, centrifuges, ventilation ducts, autoclaves, tubing and countless other types of steel equipment by which steel, through chemistry, helps tap Nature's untold wealth of better living for all America.**

\* \* \*

**[For a full color reprint of this advertisement, write Dept. H, Republic Steel, Cleveland 1, Ohio.]**



# All things are possible . . .

*It is well that we who make up the School of Engineering family consider together from time to time our common problems. I came to you as an outsider, albeit once a family member, and I brought with me an intense concern for and interest in the family. As your titular head, if not yet your pater familias, let me mention some matters of common import that I have been thinking about.*

*There seems to be a sort of a disease of spirit in our midst—a fantasy of frustration—that bothers me a bit. I say to you that this need not be so, for you are men of will and spirit if you but allow yourselves to be so. Let's stop complaining about our new building and take constructive action to help our President and Board of Trustees provide the necessities. Let's recognize what it means when you know that one out of six of our graduates are recognized leaders in the profession and that 75 per cent of our graduates are in responsible charge of engineering work. Let you who are students recognize this challenge that your older brother graduates pose to you and stop thinking only of "getting a degree."*

*Our needs are great—equipment, facilities, students, and faculty. I pledge you my entire resources to help supply our needs—but what will you do? The school is a composite reflection of each of you—are you satisfied with the image? Our opportunity is golden—we need only the will and the spirit to seize it and make your dreams and mine come true.*

*All things are possible to those who have faith, I want to be counted as one who believes—do you?*

—MARTIN A. MASON

A

# 66 YEAR SURVEY

## of a unique institution of learning

**Mervin N. McKnight**

*BSME '38, BEE '41*

The Engineering School of the George Washington University located in Washington, District of Columbia, is not a large school, however, its graduates have been fitted to compete favorably with the graduates of the larger and more widely known schools in the practice of the science of engineering.

The Engineering School was instituted in 1884, with its first engineering graduates in 1888. It was the fourth branch of the University, which was chartered by Act of Congress in 1821. Since its organization it has been known successively as the Corcoran Scientific School, the Washington College of Engineering and the School of Engineering of the George Washington University.

In the years preceding and extending well into the present century the demand for engineers and technicians in the nation's capital was limited. A similar condition prevailed in the field of the arts and sciences. Expediency therefore dictated that the curriculum of the Corcoran Scientific School should include in addition to engineering subjects, courses in anthropology, architecture, astronomy, botany, chemistry, drawing, geodesy, geology, mathematics, meteorology, mineralogy, physics and zoology.

Five deans have served the Engineering School during the 66 years since its organization. They are listed below in the order in which they served:

*Dr. Edward T. Fristoe.* In addition to being the Dean of the School, Dr. Fristoe was Professor of General and Analytical Chemistry.

*Howard L. Hodgkins.* Dean Hodgkins occupied the Chair of Mathematics in the first faculty and was also acting President of the University from 1921 to 1923.

*Hugh Miller.*

*John R. Lapham.*

*Frederick M. Feiker.* Dean Feiker was elected in 1939 and retired in August, 1951.

Throughout the span of 66 years, the School of Engineering of the George Washington University has rendered a unique service to its students as well as to the government. The majority of the students have been or are now employed as engineers or technicians in the various departments and agencies of the Federal or District government in Washington or are in the government service elsewhere in this country. Classes have been scheduled for late afternoon and evening to permit attendance by the employed students.

Full time students have also been enrolled and for them, classes are scheduled for morning and early afternoon.

There were also times when classes were arranged so that both full time and part time students might participate in order that the day students could profit by the professional experience of the employed students. The joint sessions were generally conducted in the form of discussion periods.

For students attending late afternoon and evening classes on a part time basis, 6 to 8 years were required to complete the course leading to a bachelor degree, 144 semester hours. The estimate is based on a two-semester year.

The School of Engineering of the George Washington University is accredited by the Engineer's Council for Professional Development and is recognized by the professional societies with student branches in civil, electrical, mechanical and radio engineering. There are also chapters of the two national engineering fraternities, Sigma Tau and Theta Tau, on the campus. The student publication, *MECHELECIV* has national recognition.

Prior to 1946 the part-time students generally outnumbered the full-time students. With the close of World War II these conditions were reversed when congress enacted the G.I. Bill of Rights which permitted veterans to continue their education at government expense. The School of Engineering increased its facilities to cope with the conditions resulting from

this legislation and the doubling of its normal registration. The Dean of the School, Dean Feiker, and his able corps of assistants are to be commended for the manner in which they handled the situation. Much credit must be given to the veterans for their performance as evidenced by their generally high scholastic averages.

Two other wartime activities in which the School of Engineering participated were the Civilian Pilot Training Program and the War Training Courses. The pilot training program was established in 1939 under the able leadership of Professor N. B. Ames then a reserve officer in the Army Air Force; 500 pilots were given their basic ground training under this program. The late Professor F. A. Hitchcock organized the war training courses in which more than 7,000 men and women were trained in the war effort. Professor Hitchcock gave his all to this program and his subsequent nervous breakdown and untimely death were attributable to this effort.

An indication of the School's growth is shown by the following resume of degrees conferred by the School of Engineering, arranged in periods as indicated:

Position	Civ. Eng.	Elec. Eng.	Mech. Eng.	Gen. Eng.	Total
1888-1900 inc.	24	6	5		35
1901-1920 inc.	93	62	46		201
1921-1940 inc.	199	129	153	*143	624
1941-1950 inc.	102	192	186	90	570
Total	418	389	390	233	1430

\* 46 Degrees in chemical engineering included.

A study of the above summary reveals some interesting facts, some of which are enumerated below:

Within the period 1888-1900 few degrees were bestowed in either electrical or mechanical engineering due to a lack of demand for them in governmental activities at that time. Available records show that 20 of the 35 degrees given in this period were professional, divided 17 CE, 2 EE, and 1 ME.

The 46 degrees in Chemical Engineering were occasioned by the demand for the alloying of the basic metals after the close of World War I and were bestowed between 1921 and 1933. At the present time the equivalent course is Bachelor of Science in Engineering with a major in chemistry.

Civil engineering degrees far outnumbered either the electrical or mechanical for all periods except the last, 1941-1950, when both the electrical and mechanical greatly outnumbered the civil. The increased demand for engineers trained in the fields of electronics, communications, air conditioning and refrigeration, and other electrical applications, and the design and development of the internal combustion engine with its wide range of application in the national economy, are a few salient factors responsible for this trend.

The large number of degrees conferred in the 10-

year period 1941-1950, as compared to the 20-year period 1921-1940, is attributable to the fact that 415 degrees were conferred between 1947 and 1950. A great majority of those receiving degrees during this period were enrollees under the G.I. Bill of Rights.

Of the 1430 degrees conferred in the 66 years since the School of Engineering was organized, at least 80 engineers have received two or more degrees and 170 are either deceased or their addresses are not known. The remainder of the graduates, 1180, are arranged below according to where they now reside:

District of Columbia, 400.

Maryland (Washington Metropolitan Area):

Bethesda, 33; Chevy Chase, 35; Silver Spring, 56; Takoma Park, 12; Hyattsville, 10; elsewhere in area 54; total 200.

Virginia (Washington Metropolitan Area):

Alexandria, 36; Arlington, 115; Falls Church, 12; elsewhere in area 17; total 180.

Continental United States, exclusive of Washington Metropolitan Area (arranged by states with 10 or more graduates):

Pennsylvania, 39; New Jersey, 32; New York, 74; California, 30; Illinois, 26; Massachusetts, 24; Ohio, 21; Texas, 12; Florida, 10; West Virginia, 10; Virginia (exclusive of Washington Metropolitan Area) 11; elsewhere in States with less than 10 graduates, 91; total 380.

Outside Continental United States and foreign countries:

Hawaii, Philippine Islands, Peru, Venezuela, etc., 20.

Many of George Washington's engineers have risen to prominent positions since they graduated. Just to mention a few:

*William C. Thom*, BSCE '04, Chief Engineer, Naval Gun Factory. Awarded the Distinguished Civilian Service Award in recognition for his services.

*P. H. Girouard*, BSME '26, Chief Engineer, Bureau of Ordnance, Navy. Medal of Merit from the President of the United States and Distinguished Civilian Service Award.

*William F. Roeser*, BSEE '25, AM '29, Technical Consultant to Division of Building Technology, Bureau of Standards.

*H. V. Darling*, BSCE '33, Chief Civilian Engineer, Mississippi River Commission, Army Corps of Engineers.

*F. A. Howard*, BSME '11, LLB '14, President, Standard Oil Development Co. and Vice President of Standard Oil of New Jersey.

*Charles H. Tompkins*, BSCE '09, President, Charles H. Tompkins Construction Company. Donated funds for new Engineering School Building.



—Westinghouse

4000-HP Gas-Turbine Locomotive

In the fall of 1941 a new type of locomotive was introduced with the delivery to the Swiss Federal Railways of a gas-turbine locomotive built by Brown Boveri and Company. In the last ten years four gas-turbine locomotives have been built and are operating and several more are in the design and building stage.

All the above mentioned units use oil for fuel. For the past several years the Bituminous Coal Research Locomotive Development Committee has been experimenting on and designing a coal-burning gas-turbine of which two are to be built, one by Allis-Chalmers and one by the Elliot Company.

Of the four locomotives that have been built, two (including the original one) were built by Brown, Boveri and the Swiss Locomotive and Machine Works and are being used in Switzerland and England. The third was built by the American Locomotive Company (Alco) and General Electric and is in use on the Union Pacific Railroad. The fourth is just entering into its road tests and is a product of the Baldwin Locomotive Works and Westinghouse Electric Corp.

It is reported that Metropolitan Vickers is building a gas-turbine for the British Railways and Alstom one for the French Railways. Late last year the Union Pacific, on the basis of tests conducted, ordered ten gas-turbines from ALCO-GE.

Every gas-turbine locomotive built up to this time has had an electric transmission system identical or at least similar to existing diesel-electric locomotives and are using already well-developed electrical equipment. The designers of the coal-burning units are trying to develop a mechanical drive, of which there is yet very little information. Since the electrical systems are quite common and our interest is primarily in the gas-turbine, little will be said about transmission systems.

Essentially the gas-turbine consists of three elements: the compressor, the combustor and the turbine. The purpose of the compressor is to draw in the air and compress it to decrease the volume. Gas-turbine compressors are always of the axial type in

# The Gas-Turbine Locomotive

Richard A. Sorrell

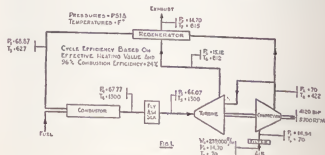
Undergraduate in Mechanical Engineering

order to handle the large volume of air required. The combustor introduces heat energy by burning a fuel in the stream of compressed air which is then expanded in the turbine producing mechanical energy which can be used to produce work.

To these essentials may be added several other elements to increase efficiency and output and improve operation. One of these is the compressor intercooler. By making the compressor operate in two groups of stages an intercooler may be placed between the amount of work needed for the compression and thereby increasing the output of the unit. An intercooler will also permit a reduction in size of the compressor.

The output for a given unit is governed by the temperature of the gases entering the turbine. By recovering some of the heat in the exhaust by means of a heat recovery element or regenerator, as it is called, output will be increased for a given amount of fuel. Turbine operating temperatures average about 1300° F. Therefore, to prevent the turbine blading from burning up it is desirable and necessary to have some type of cooling. In order to accomplish this, the turbine blading is made with many small passages which extend radially through them from hub to tip of blade, and through which compressed air bled from the compressor is permitted to flow.

Finally, there is a fly-ash separator which is necessary in the coal-burning units to prevent corrosion



Schematic — Gas-Turbine Cycle

of the turbine blading.

Fig. 1 shows a schematic of a gas-turbine cycle for a coal-burning locomotive, a projected design by Allis-Chalmers. The temperatures and pressures shown are typical for gas-turbines and are not necessarily actual values for this design.

The flow of gases is as follows: Air is taken into the compressor through a filter. From the compressor the air goes to the regenerator where heat from the exhaust is exchanged to the incoming air. A line from the outlet of the compressor brings air to the turbine for cooling the blades as explained above. Air from the regenerator flows to the combustor where fuel (in this case powdered coal) is burned which increases the temperature of this air a little more than twice its entering temperature. Immediately after the combustor is a separator that removes the fly-ash from the stream of gases. The gases expand through the turbine and exhaust to the atmosphere through the regenerator. This is known as an open cycle since the intake and exhaust is open to the atmosphere. A closed cycle would recirculate the air over and over requiring a cooler and surface-type combustor. The closed cycle is impractical except for installations having a great deal of space available which, of course, locomotives do not have.

Pressure in these units range from 14.7 to 80 pounds per square inch absolute. Since pressures are fairly low, temperatures are the biggest problem in design. The thermal efficiencies of these units are, in actual test, around 16 to 18 per cent. However, with improved turbine materials these units are expected to equal or even surpass diesel efficiencies with turbine operating temperatures of 1600° F or more.

#### THE BROWN, BOVERI LOCOMOTIVE

The original locomotive built in 1941 is rated at 2200 hp at the turbine shaft when the ambient temperature is 68° F. At 100° F, ambient, the turbine output drops to 1700 hp, while at -4° F the output is 3000 hp. Characteristics curves show that the maximum thermal efficiency is about 17.8% at 1750 hp. Test data shows that for a run of 100.2 miles at an average speed of 446 mph with a 430-ton train the fuel consumption was 1.21 pounds per horsepower-hour giving an average thermal efficiency of 11.1%.

For a run of 60.4 miles at an average speed of 43.5 mph with a 313-ton train the fuel consumption was 1.49 lbs/hp-hr. and the efficiency 9%. These efficiencies seem low but it must be noted that the locomotive was only loaded to 48.8% of full load in the first case and 39.0% in the second.

This unit has a regenerator and differs from the usual American practice in that it has one vertical combustor, in which the fuel is sprayed in a downward direction, instead of several horizontal combustors.

The electric transmissions consist of four traction

motors driven from one generator which is also used as the starting motor for the turbine.

The total weight of the locomotive with loaded fuel tanks is 101 tons, with a weight of 70 tons on the drivers.

#### THE ALCO-GE LOCOMOTIVE

General Electric's locomotive, built in 1949, is the only gas-turbine operating in service in America at the present time. This unit is rated at 4800 hp at 80° F, ambient, and 1500 ft. elevation. At sea-level it will develop approximately 5000 hp, and under cold-weather conditions has been run with an actual output of 6400 hp. *This is 125% rated output.* The estimated thermal efficiency was between 17 and 18 per cent, and under rated power conditions has an efficiency of 17% based on the Lower Heating Value of the fuel.

The design temperature at the turbine inlet for rated power was 1400° F; however, the operating inlet temperature was 1300° F. By increasing this temperature to 1400°, the output was increased to 6000 hp, or 120% rated horsepower with a thermal efficiency of 18.5%. There has been very little expansion or vibration trouble.

The unit uses diesel oil when starting with Bunker "C" being the operating fuel. To date, there has been no need to make fuel restrictions since the commercial Bunker "C" fuels have been satisfactory and combustion efficiency has been more than 96%. A comparison of specific fuel consumption shows consumption for this unit to be relatively high compared to an oil-burning steam locomotive.

This unit has a fifteen-stage compressor and a two-stage turbine which exhausts through the roof. There are no regenerators or intercoolers. The power plant governor, fuel pumps, etc. are mechanically driven from a shaft extension on the inlet end. On the outlet end are geared four generators which drive eight traction motors, two to each generator. The traction motor blowers, water circulating pumps, cooling fans, exciter, etc., are electrically driven. The unit is started with a generator driven by a six cylinder, 200 hp diesel which drives the main generator as a starting motor at 55 rpm. This same diesel driven generator is used for traction power when the locomotive is being shunted or moved for short distances about the shops or yards.

The locomotive output is 400 hp giving a tractive effort of 150,000 pounds at 30 per cent adhesion. The other 300 hp is used for auxiliary purposes. Turbine speed is 6700 rpm which is geared down to 1600 rpm at the generator. Maximum speed of the locomotive, which is limited by the traction motors, is 69 mph.

Weight of the locomotive is 250 tons. The turbine unit weighs 20,000 pounds giving a weight-power ratio of a little over 4 pounds per horsepower. As a comparison, the total propulsion equipment weighs

(continued on page 22)

## NEWS AND VIEWS

### NEWS FROM ZURICH

Norman B. Ames, in his last letter, said that it was good to hear of happenings at G.W. and to know that things are in good hands. He also said that he liked to talk student activities with the people in Zurich but they don't seem to go for things as we do over here. They put on the most fantastic social affairs—"Polybal"—once a year. One has never seen anything like it. They also have an active group which puts on movies regularly. Prof. Ames also said he gave a "little talk" at the institute last week (this was some time in February) and will repeat it again at the local GE get-together for engineers. The "Deacon" sends his best wishes to all.

### OUR BOY EMMETT

Air Cadet Emmett G. DeVries, former Associate Editor of MECHLECIV, bemoans leaving the comforts of the School of Engineering for the rigors of the Air Force at Bartow AFB, Florida. Besides piling up ten hours of dual time (in air-planes), so far, he also has time to do a little missionary work among the natives. Photo shows Emmett with Cypress Gardens native.



### OPEN HOUSE TO BE ANNUAL AFFAIR

The School of Engineering held its first "Open House" on March 5 in conjunction with College Day. This event was tried on an experimental basis to see if a sufficient number of high school students, as well as alumni from this university, would be interested in attending. The high school students were invited in order that they might become acquainted with what the School of Engineering has to offer. The Alums were requested to return and see what had transpired in the school since their departure, as well as to meet the present students and exchange ideas and pleasantries.

The first Open House attracted twenty high school students and twenty-five alumni. This can be considered a good turn-out in view of the short time allowed for preparing the program and announcements. Dean Mason donated considerable time, effort and assistance in the planning and Prof. Antel, ably assisted by Bill Wooldridge, AIEE Council Delegate, deserve compliments for their untiring efforts towards the preparation for this event.

It is contemplated that next year's affair will be of the seminar type and will extend over a period of two days, beginning with the day before the Engineer's Banquet and terminating with the Banquet as a part of the program.

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How well this idea has worked is amply demonstrated by the outstanding leadership record which Pratt & Whitney has established in both piston and turbine aircraft engine types.

And for the future, because of its sound engineering background and research facilities, Pratt & Whitney is one of the few companies in the country to be selected to develop an atomic powered engine for aircraft.

Creative engineering will continue to be given top emphasis at Pratt & Whitney—and it might well be the best answer to *your* future too—if you want a chance to put *your own* ideas to work.

Why not find out where you could fit into this great engineering organization? Consult your Placement Counselor or write to Frank W. Powers, Engineering Department at

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DIVISION OF UNITED AIRCRAFT CORPORATION  
EAST HARTFORD, CONNECTICUT

## What? A Non-Log Slip-Stick?

A. B. Moe, BCE '52

For many years, engineers and others who must work with mathematical computations have leaned heavily on a method of computation invented by one John Napier back in 1614, logarithms; or have depended on a more mechanical method that utilized the invention of Edmund Gunter in 1620, the logarithmic scale, in an instrument known to all as the slide rule. The slide rule, as everyone knows, automatically computes by sliding two logarithmic scales, past one another, utilizing the principle of adding or subtracting logs plotted on these scales.

An electronics engineer working for the Navy has recently developed a number of methods that permit almost all the computations possible on a log-type slide rule to be performed by a manipulation of linear scales, sometimes with greater accuracy. Morris Lewis Groder, who has permitted the author unlimited use of the material contained in his book "Linear Scale Non-Logarithmic Slide Rules", bases his principle on the well-known geometrical postulate: "Two pairs of corresponding sides of similar triangles may be presented as a proportion. The relationship may also be signified by the mathematical expression,  $T/U=S/C$ . If the value of unity (1) is assigned to U, the expression may be written  $T=S/C$  which represents the process of division, or if transposed:  $S=TC$ , the process of multiplication."

One can readily see that to construct a simple computer it is only necessary to construct a pair of proportional triangles whose calibrated sides can be varied in length. For instance, take a sheet of cross-sectional paper. At intervals of one inch, horizontally, write numbers 0 through ten. Draw a line vertically up from ten and number this line the same. Now, if a ruler or straight edge were to be rotated around 0 on the horizontal line, it would form the side known as the hypotenuse to the triangle formed by the horizontal and vertical numbered sides.

To use this home-made computing device, say, to multiply  $6 \times 5$ , it is only necessary to rotate the ruler until it intersects 0 on the horizontal and 6 on the vertical. Then a vertical line is drawn up to the diagonal from 5 and a horizontal line is drawn from its intersection with the diagonal to the vertical numbered line and it will be seen that it bisects 3 on this line. By adding the integers in the problem,  $1+1$ , two integers will be required in the answer and the answer becomes 30. (General rule.)

Let us see how this is done. Draw a triangle so that the vertical side is perpendicular to the base. The vertical will be called T and the base, U. Now intersect this triangle vertically and call the new vertical S, and the corresponding base, C. Apply the numbers of the problem above to this figure and you will see that  $TC=S$ , or that  $6 \times 5=30$ .

This is just one simple example of the workings of this device. If the cross-sectional paper contained 100 divisions to the inch, it can readily be seen that unusual accuracy can be obtained. Linear slide rules can also perform, with ease and with accuracy, problems involving polar-rectangular coordinate conversion, roots, powers, logarithms, and trigonometric functions without recourse to mathematical tables, computation or special construction tools. With this thing you can also add or subtract while multiplying or dividing.

Imagine the chagrin of a student reporting for a quiz and finding that he has inadvertently left his good old slide rule in his room. If he knew something of linear computing devices, he would merely take his ruler and lay out a linear slide rule or take a sheet of cross-sectional paper and be ready for business in a few minutes.

It is the intention of this author to write a more comprehensive article on this method of computation in a later issue of this magazine. This method of computation should be of interest to others who are not engineers, or scientists as well, since it is a simple mathematical device that obtains satisfactory results and eliminates to a great extent the use of tables, and other construction devices that are often either not available or cumbersome to carry around.



**New No. 4  
AUTOMATIC  
Screw Machine**

**... for low-cost, medium sized  
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Modern in design, massive in construction, assures continuous, accurate production of medium size parts for cameras, automobiles, business machines, time fuses, etc. Wide range of speeds and high-to-low speed ratios, (168 two-speed combinations from 17 to 1965 R.P.M. in ratios from 2.2:1 to 13:1) make possible highest cutting efficiency on a wide variety of materials and work diameters.

Write for illustrated bulletin on the new No. 4 Automatic. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

**BROWN & SHARPE** 

# OUR GRADUATES for 1952

## CIVIL ENGINEERS

Brewer, Joseph D.  
Burns, B. C.  
Caffes, P. J., Theta Tau  
Cummings, George P., Gate and Key; President, Sigma Pi Epsilon  
Haddox, D. D.  
Hord, Keith S., Engineers' Council; Marshall, Theta Tau; Mecheleciv; President, ASCE  
Hughes, Edmund C., Phi Eta Sigma; Alpha Theta Nu; Sigma Tau; Sigma Chi; Mecheleciv; ASCE; Freshman and Varsity Baseball  
Mathews, Edward R., Sigma Alpha Epsilon; ASCE  
Romett, J. M.  
Sanders, Ralph B., Mecheleciv; ASCE  
Seabrooke, W. W., Engineers' Council; Mecheleciv; Theta Tau; Omicron Delta Kappa; Pi Delta Epsilon  
Welles, R. H., Sigma Tau; ASCE

## ELECTRICAL ENGINEERS

Anderson, Ben E., Secretary, Engineers' Council; Sigma Tau; Theta Tau; AIEE  
Andress, Frank S., Sigma Tau  
Bass, C. A., Sigma Tau  
Battle, Fred H., Sigma Tau; Theta Tau; Vice President, Engineers' Council; IRE  
Beardsley, James H., Sigma Tau; Chairman, Career Conference Committee, Engineers' Council  
Benjamin, Vernon E.  
Crickenberger, I.  
Gager, C. C., Jr., Sigma Tau  
Gilliam, Frank P.  
Halperin, Murray, Gate and Key; Alpha Epsilon Pi; AIEE; Colonial Boosters; Hillcl  
Held, John C., Sigma Tau; Theta Tau; IRE; AIEE; Masonic Club

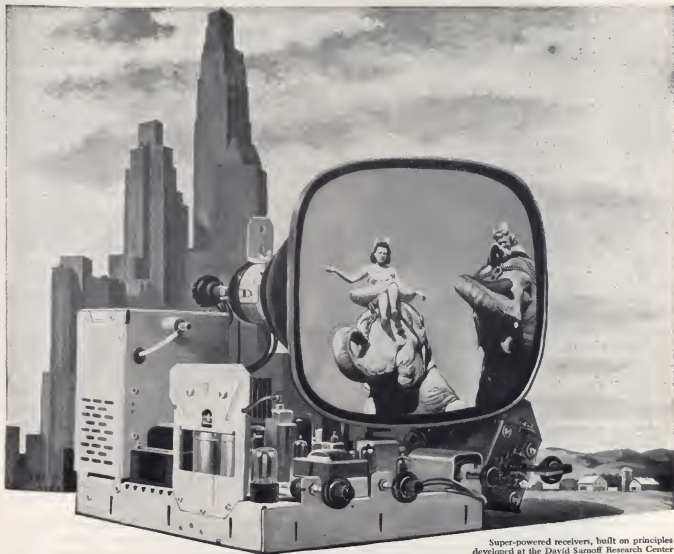
Holcomb, Frederick M.  
Hughes, J. T.  
Kyse, Warren E., Sigma Tau; AIEE  
Laubscher, Lawrence E., Sigma Tau; Sigma Nu; Mecheleciv; Colonial Boosters; AIEE; Varsity Tennis  
Loyk, V.  
May-Wells, Wilfred J., Sigma Tau, AIEE, IRE  
Noble, William O.  
Norwood, Herman Jr., Sigma Tau; Engineers' Council; Theta Tau; IRE  
O'Blazney, A. A.  
Rice, John F.  
Roa, Arturo, AIEE  
Schlemmer, Roy R. Jr., Gate and Key; Delta Tau Delta; AIEE; Swimming Team  
Schoemaker, E. F.  
Schuppin, Louis A.  
Sly, Robert D., Sigma Tau; AIEE; IRE  
Sing, Milton E., Sigma Tau; AIEE; IRE  
Simpson, James W., Engineers' Council; Mecheleciv; AIEE  
Sonnebend, Joel S., Sigma Tau; Engineers' Council; Theta Tau; IRE  
Trainer, R. F.  
Wooldridge, William A., Sigma Tau; Theta Tau; Chairman, AIEE  
Van Allen, Roland L., Sigma Tau; IRE  
Zeigler, L. L., Theta Tau

## MECHANICAL ENGINEERS

Batalo, George, Sigma Tau; ASME  
Bone, Evert L.  
Finch, L. E., ASME; Theta Tau  
Goulden, P. V.  
Hamon, W.  
Harwood, William R., Sigma Tau; Who's Who in American Colleges; Engineers' Council; Student Union Board Chairman, Student Council; ASME; Capt., Sailing Club  
Julius, R. F., Theta Tau; ASME  
McCarthy, D. J.  
Moody, Horace R., Sigma Tau; ASME  
Mooney, Mark W.  
Nicholas, William  
Nicolia, Vincenzo A.  
Plyer, Charles H., Sigma Tau; President, Omicron Delta Kappa; Theta Tau; President, Engineers' Council; Editor, Mecheleciv; Who's Who in American Colleges; Pi Delta Epsilon, Student Life Committee; President, Kappa Alpha; Editor, Student Handbook; Theta Tau; ASME  
Smith, R. D.  
Talbert, B. F., ASME  
Taylor, S. DeG., ASME; Treasurer, Engineers' Council  
Thompson, G. L. Jr.

## SCIENCE IN ENGINEERING

Newey, J. P. (Bus. Adm.) Sigma Tau; ASME



Super-powered receivers, built on principles developed at the David Sarnoff Research Center of RCA, bring clearer television pictures to more homes.

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Although no new TV stations have been built since 1950, television's reach has been extended in *two ways*. In sections of cities where interference is a problem, fine pictures can now be seen. The same is true in rural, or TV "fringe" areas, formerly too distant for clear reception.

RCA engineers and scientists, to offset these limitations, developed powerful new Super Sets. In distant fringe areas, these sets boost a weak or faltering signal into a clear, steady picture. While in cities, where buildings and electrical

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  - Design of component parts such as coils, loudspeakers, capacitors.
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  - Design of receiving, power, cathode ray, gas and photo tubes.
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# ALUMNEWS

We are currently being flooded with news from Alums from all over the world and we will do our best to print as much of it as we can. We haven't been getting the Alum subscriptions we were expecting so we are handicapped by being unable to expand the magazine to more pages. Accordingly, not as much room for Alumnews as we would like.

The compliments paid by those who write in greatly outweigh the complaints, which is quite pleasant we assure you. However, it would be beneficial if a few suggestions for improvements came along with the compliments. It can't be that we are perfect yet.

Some of this material is brought over from that which was intended for publication in the April issue and to start things rolling, Robert T. Surine, BME '49 of 1523 E. Franklin Lane, Silver Spring, Md., went so far as to say, "Certainly look forward to receiving MECHELECIV - IT'S GOOD." Bob became the father (second time) of Robert T., Jr. last November; he already has a little girl, Alice Virginia, age two. Are you going to send the boy to G.W., Bob? \* \* \* William Frahm, BEE '49, tells us to keep up the good work and also reveals that he strayed a bit from the engineering profession. He has a big farm, 760 acres, out in Oelrichs, So. Dak., Address, Box 82. Besides running sheep and cattle he is expecting to have about 300 acres in wheat this year.

Joseph F. Allen, BSME '35, 2143 Swift Blvd., Houston, Texas, was recently made Chief Plant Engineer for the Cameron Iron Works and is busy coordinating a 13-million-dollar expansion program that includes a new 11,000-ton forging press, other heavy presses and melting furnaces. Prior to going with Cameron Joe worked for Warner and Swasey, one of our advertisers, for about seventeen years. He is married and has three children, and thinks Houston is a great city. He also says that Cameron offers many opportunities for engineers. Better write to him boys. \* \* \* Lloyd L. Smith, way back in '05, is out in Minneapolis, Minn. He is associated with the Paul A. Laurence Co., constructors, and lives at 615 Second Ave. So.

Warren C. Crump, BCE '40, 4837 16th Street, N.E., Washington, says he frequently misses good society meetings because he gets MECHELECIV after a meeting has been held. Yes, Warren, we know that and we hope to remedy the situation as soon as possible. We have been needling the societies to give us sufficient notice so that we could announce the program for a meeting at least one month in advance. \* \* \* Karl O. Vartia, BCE '37, P.O. Box 817, Austin, Texas (why is everybody going to Texas?) asks "How do you pronounce it?" Well, Karl, its "Mek" for mech-

anical, "Ele" for electrical and "Siv" for civil. That's about as close as we can come, phonetically. \* \* \* Victor L. Reddle, BME and a '49er, lives at 5721 N. 11th St. out in Arlington. He is an ME at Reed Research, Inc., in Washington. Vic is presently engaged in the design and development of photogrammetric optical instruments.

Joseph B. Taphorn, BSE '49, 13 Andrew Road, Tuckahoe, N.Y., says, "Offer a course in report writing. No reflection on the magazine—too few engineers can convey effectively their ideas and conclusions." Joe, we are not trying to make writers out of our engineers but we do like to print, for the enjoyment and information of others, student papers that are of professional caliber and which we consider may be of particular interest to the majority of our readers. You are right, though, Engineers are notoriously poor writers and pretty poor speakers as a whole, but they are getting better. At least they are working at it. \* \* \* LCDR Howard S. Cole, C&GS, has been operating in Alaskan waters for the past few years. Up to this time he has been Electronics Officer on various C&G Survey ships but in March he was transferred to Texas where he is to be in charge of a triangulation party. Join the Texas Navy, Howard.

Dr. Adolph C. Hugin, EE '28, 5720 Southern Ave., S.E., has recently published two articles: "Radio Broadcasting under Governmental Regulation", *Oklahoma Law Review* Nov. 1951; and "Airspace Rights and Liabilities as Affected by Aircraft Operation", *Notre Dame Lawyer*, (two installments, summer and fall issue, 1951). At the present time Dr. Hugin is Visiting Professor of Law at Catholic U. \* \* \* William F. Roeser, BSEE '25, MS '29, 604 Rolling Road, Chevy Chase, Md., is on the Alum Advisory Board of the MECHELECIV. He says, "I am in the Bull Pen, warmed up and ready to pitch." O.K. Bill, get together with the rest of the Board and come up with suggestions on how to convince the Alums that they can use MECHELECIV to good advantage in keeping in touch with their old classmates and fellow students. \* \* \* Solomon Fineblum, BME '50, 5427 Iowa St., San Diego, Calif., is evidently the strong silent type. He merely says, "Daughter—Deborah Ellen—born Oct. 15, 1951." Congratulations Solly, but we are sure you can say more than that. What are G.W. engineers doing out in Sunny Cal these days?

Daniel K. Dotson, BCE '50, 3840 Newland St., Wheatridge, Colo., is with the Bureau of Reclamation in the Construction Contract Adjustment Divi-

(continued on page 18)

# I am Industry-1952

Ushered into a new world,  
I had a bustling, brawling, bruising youth.  
I was a potential giant awakening in a world of giants.  
People were hurt when I first stirred in life;  
Then I grew and learned,  
Then I matured and knew that  
Though I work with water and metal and chemicals and fire,  
I am more than these things.  
I am the people's work!  
I am the people's dream!  
*I am the people!*

With maturity, I have grown, too, in social responsibility  
To the people,  
To America!  
And even to those beyond our shores.  
My efforts are not in selfish interest;  
Rather, all my brain and brawn strives for the good of the many.  
*I am the American way!*

Now, I have sworn that these things shall be:  
I shall deliver ever-better products to those who use my fruits!  
I shall offer equal opportunity to those who work at my side  
Whatever their race!  
Whatever their creed!  
Whatever their color!  
Whatever their national origin!  
I shall forever do my part to keep America great!

And why?  
Because only in this way can I remain a healthy force in our free world.  
For when I am healthy, America prospers  
And tyrants tremble before my might.

I am America's life-blood!  
I am America's strength!  
*I am the bulwark of  
the World's freedom!*



## Societies and Fraternities



• Gamma Beta Chapter held its annual election of officers on March 14th. The following were elected to carry on the good work performed by ex-Regent Dick Caldwell and his staff this past year: Regent, Al Moe; Vice Regent, Dan Andrich; Scribe, Shep McLaurin; Assistant Scribe, Jim Colangelo; Assistant Treasurer,

Tom Flanagan; Corresponding Secretary, Bob Burns; Marshall, Paul Couper; Inner Guard, Dick Caldwell; Outer Guard, Ed Davitt and Historian, John Dodge to assist Brother Rose.

The April 9th meeting was spent in the selection of pledges who were invited to attend an informal smoker at the Sigma Chi House on April 20. Other events were held in abeyance pending a decision by Theta Tau alumni to hold their spring dance at the Cameron Club in Alexandria May 17th.

Activities are expected to continue during the summer. The usual shrimp feast, picnics and other affairs are going to be scheduled.



• Saturday, May 19th, Xi Chapter initiated the following new members into the Sigma Tau: Herbert Chandler, Louis E. Johnson, Charles Laughlin, Robert P. Little, Rudolph Ness, Donald Rodenhi, Howard Wilson, George Gould, Harold Boyd, and Hsin Wong. Bland Burns un-

fortunately had undergone an appendectomy the week before the initiation and was unable to attend. He will be initiated as soon as he is on his feet again which will be around the 21st of April.

The initiation banquet was held in the Silver Room of the Hamilton Hotel. Two skits put on by the initiates, "The Shooting of Dan McGrew" and "Radio Dialing", amused the diners and honored guests. Dr. and Mrs. Feiker, Prof. and Mrs. Cruikshanks and Mr. and Mrs. William Roeser were seated at the speakers' table. The dance that followed was well attended until the last note of the final number signalled the end of a successful and pleasant evening.

• The first Annual Student IRE Award are now history. These awards will be made annually to students in good standing with the Student Branch of the Society and who are in their final undergraduate year. One award is made by the National Society based on recom-



(continued on page 20)

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## ALUMNEWS . . . (continued from page 16)

sion, Denver. \* \* \* Henry E. Hutto, BME '49, 26731 Woodmont, Roseville, Mich., is a permanent mold design engineer with the Detroit Works, Aluminum Company of America. \* \* \* Robert H. Spittler, BEE '51, 11 Danbury St., S.W., is working part-time as an Associate in Electrical Engineering at G. W. He sends a plea to the hydraulics boys not to blow up his Communications Lab on Thursday night. Don't worry, Bob, that's probably Kerley building up a little head. \* \* \* C. E. Proudley, BSCE '27, CE '33, Box 1013, Raleigh, N.C., claims there is a brief reference about himself in "Who's Who in Engineering" provided it hasn't been cut out since he didn't buy a copy. Go ahead and buy it, man.

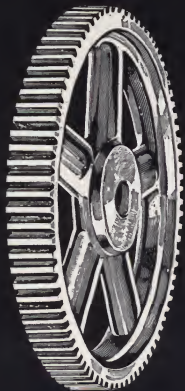
Murray Berdick, BS Chem. '42, 231 Lexington Ave., N.Y., has been awarded the Eli Lilly Research Fellowship in Chemistry at the Institute for Polymer Research, Polytechnic Institute of Brooklyn where he will work for his Ph.D. in Chemistry. He had previously received his MS there and was elected to Sigma Xi (Research Honorary) and Phi Lambda (Chem. Honorary). Keep up the good work Murray.

Don't forget Alums, we need all the support we can get from you to keep this thing going and to continue the improvement of the magazine. Just keep this under your hat—if we get the subscriptions, we are going to publish from four to eight more pages and maybe put out a cover in color from time time to time. We scooped in publishing the pictures of the new Engineering School buildings but the pictures of these beautiful structures should have been in color so you could have fully appreciated what fine additions they will be to the George Washington campus. News of the progress of the new buildings will be brought to you as fast as we get it. Dr. Marvin has hinted that he will give the news first to MECHLECIV.

Now for a few more alums. \* \* \* Judson Hulsey, BEE '51, is with the American Instrument Co. in Silver Spring. He is still going to G. W., working on his MS. \* \* \* Edmund F. Bailer, BEE '51, is now living out in Arlington with his pretty bride of almost a year. Ed is with the Potomac Electric Power Co.

Norman Miller, BME '49, up in Bristol, Conn., comes right back with some good dope on himself. He has been with Bowser Technical Refrigeration, Terryville, Conn., since May '51. He was recently promoted from Project Engineer to Chief Engineer with that company. He is also prepared to send in an article on test chambers manufactured by that firm, which simulate environmental conditions of temperature, humidity, altitude, rain, sun, sand and dust. Looks like you can conjure up a little home-made hell with that contraption. Let's hear about it, Norm.

(continued on page 20)



#### **ANCESTRY UNKNOWN . . .**

No one knows who first thought of gears as a means of transmitting power or motion . . . but without them modern civilization could not function.

There would be no clocks, cars or calculators . . . industry would revert to hand production . . . transportation would go back to the horse and buggy . . . household chores would multiply . . . office managers would be seeking mathematical geniuses.

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HEADQUARTERS FOR BUSINESS INFORMATION



## SOCIETIES AND FRATERNITIES . . . (from page 18)

mentations of a special awards committee who conduct oral quizzes to ascertain the students' understanding of electrical problems. The Washington Committee includes Prof. Carley, GWU; Dr. Tom J. Killian, ONR; Dr. Herbert G. Dorsey, CREI; Mr. George Corcoran, U of Maryland; and Dr. Robert Sarnbacher, National Scientific Labs, Inc., Committee President. The second award is based on the student's contribution to student affairs in IRE activities.

First winners of these coveted awards are: Roland L. Van Allen, National Award; Ben E. Anderson, Honorable Mention. Fred Battle, Sectional Award; Herman Norwood, Honorable Mention. Winners receive first year's dues and Associate Membership to IRE. Honorable Mention Certificates are presented to the runners-up. Awards were given at the Engineer's Banquet on May 3rd.



- ASCE will hold prize paper competition May 6th. At this instant only two papers have been entered: "Professional Ethics" by Rex Sanders and "Talgo, Train of Tomorrow" by Al Moe.

All who missed Col. Douglas Gillette's talk on the White House renovation really missed something.

- The AIEE joined with the IRE in April to hear Mr. Raymond Kaplan of the "Voice of America" speak on the Voice's new floating transmitter, the USS Courier.

The May meeting of AIEE will consist of election of officers to replace the past year's officers who did an outstanding job.

Sorry: No news from ASME.



## ALUMNEWS . . . (continued from page 18)

• • • Lloyd N. McCall, BME '49, Red Oaks Mill, Poughkeepsie, N. Y., says "Hello" to Prof. Greeley and also tells us he was transferred from Washington about eighteen months ago, completed two assignments in IBM's Plant No. 2 and was subsequently promoted to the position of Administrative Assistant to the Plant Superintendent. • • • May Wells, BEE '52 (Spring) was the first of the recent grads to kick in with his buck for MECHELECIV for the rest of the rest of the year. He says the magazine is so good he doesn't want to miss a single copy. We have heard the same from several others, too.

REMEMBER! IF WE DON'T GET IT, WE CAN'T PRINT IT. SEND IT IN!

## INCREMENTS . . .

- Listed below are a few remarks taken from an article in THE FOUNDATION, a publication of The Engineering Society of Detroit. The article is entitled "Why Some Engineers Remain in the Engineering Department."

1. Inability to express themselves. A management or sales executive has to be able to understand in simple terms, and quickly, certain design aspects to enable him to make decisions. The engineer who cannot write a good intelligible report without too many technical terms, or talk on his feet in a meeting has slipped on the first rung of the ladder of recognition.

2. They are anti-social. If you examine the background of any successful engineer whether he is a chief engineer, a sales manager or a company president, you will find that he is an active member of several social and technical groups. Many are active in community affairs. And last, but not least, they are well liked and affable. They are nice people to meet.

3. They are too specialized. As much as the truth hurts, it is a proven fact that the engineer who becomes a specialist in a given field will remain in that field. True, there are good jobs for specialists, and many people prefer to be experts. But those engineers who want to further their opportunities must avoid specialization.

*Don't be deceived by logic. Most problems are full of emotion. Emotions aren't "logical."*



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**F**ANATICS in Germany, India, even some in America, say we should scatter our billions over the world in order to use up our surplus; otherwise (they say) it will dam up on us and cause a depression.

It is entirely possible that we should give away those billions for humanitarian reasons—that is another matter. But don't let's let greedy foreigners and stupid Americans say we're doing it for our own selfish interests. And don't let anyone of us think we are doing it by "soaking the rich". We are giving away (and, remember, perhaps we should, so long as we do it with eyes open) our standard of living.

You and I work, not for dollars but for what those dollars will buy. The more *things* there are in America, the more your day's work and mine will buy. The more steel there is in America, the more automobiles you can get at a low price. The more cloth, the more suits you can own. The more food there is, the better you and your family will eat.

There can only be so much of those things. When you ship them away; you do without. You seldom ship *money* abroad; money is only a token of exchange for the *things* that are going out of this country, out of your reach.

Perhaps that's good, perhaps that's wise. But we should realize what we're doing. Whatever we give away abroad comes out of what we have at home. Unless, of course, each of us produces that much more at his machine or plow or desk *every day*.

If every one of us *produces* more efficiently we can have the satisfaction of knowing we are doing something for the world without destroying America . . . the one strong hope of the world. If we "share the wealth" with the world, we will soon be sharing nothing but poverty. If we share our *increased production* and demand increased production in return, there will then be wealth *and* strength to share.



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**GAS-TURBINE . . . (continued from page 11)**

22 pounds per horsepower while the total propulsion equipment of a diesel locomotive weighs 25 pounds per horse power. A comparison of length-power rated at 2000 hp at an ambient temperature of 80° from 31 to 42 hp per ft for diesel-electric locomotives.

**THE WESTINGHOUSE LOCOMOTIVE**

Westinghouse has just finished building their locomotive. They have chosen two gas-turbine units each rated at 2000 hp at an ambient temperature of 80° F and sea-level pressure. Two turbine units were chosen because of flexibility of operation and greater independence against road failures. The air intake is on the roof and feeds to a 23-stage compressor. Twelve combustors are used to raise the air temperature to 1350° F which then expands through an eight-stage turbine. *Approximately two-thirds of the turbine output is used to drive the compressors.* Starting is accomplished by the main generators operating as motors from storage batteries.

**Advantages**

First, is the low weight per horsepower due to higher engine speeds. This is particularly advantageous for large horsepower units since costs for rebuilding and strengthening track and structures for heavier locomotives is not necessary and the locomotive does not have to haul as much dead weight.

Second, is the constant torque output of the unit. This eliminates vibration, pounding and non-uniform power torque.

Third, is the increased output with low ambient temperatures. This is due to increased volumetric efficiency of the compressor. This advantage has been well used on the Swiss Railway locomotives built by Brown, Boveri. In Switzerland, trains are electrically heated. Since output is increased in cold weather when heating loads are highest, the excess power produced is used for train heating.

Fourth, the gas turbine is adaptable to any fuel. This may prove a great advantage if and when our oil supplies ever reach the scarcity which has been predicted. Also geographical location may make one fuel more advantageous in cost over another.

Fifth, is initial cost. Due to simpler construction than the diesel it is predicted that the gas turbine will, for equal horsepower, have a lower first cost. At the present, maintenance costs as compared to other types of locomotives have not been determined.

Sixth, is a better dynamic braking system. Braking may be accomplished by feeding the output of the traction motors being used as generators to drive the

(continued on page 24)

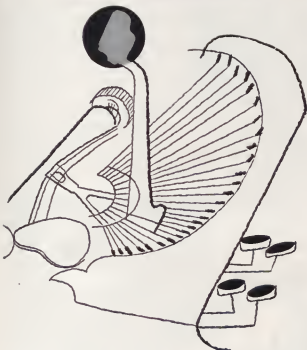
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# What's Happening at CRUCIBLE

about special shape type steel



## Crucible special purpose steel for type character application

The development of cold rolled special shape type steel is one of Crucible's important contributions to the business machine industry. A major part of the type characters used for the manufacture of typewriters are made from this special shape.

## Here's the step-by-step process:

1. Cold rolled special shape produced by Crucible.



3. The wings of the type slug are bent down and taper formed toward the edges.



2. The type slug cut from the special shape material.



4. The type characters are cold swaged on the solid edge of the bent type slug.



5. The flash trimmed off after the swaging operation.



6. The finished type ready for hardening, plating and soldering to the type bar.



The production of Crucible steel for this job is the result of engineering and practical know-how combined with a special method of manufacture to assure a homogeneous microstructure for maximum forming properties, excellent surface characteristics for good die life, and close accuracy control for all dimensions of the shape.

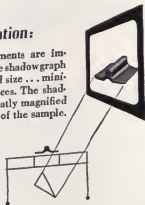
The production of type steel requires the use of small precision rolling mills equipped with shaped rolls and operated by skilled workmen. During preliminary and final inspection, shadowgraph equipment is constantly used to check for size accuracy.

As a result of its outstanding quality, Crucible's special shape type steel is constantly in demand and used by leading typewriter manufacturers.

## Shadowgraph Operation:

Since micrometer measurements are impractical due to the shape, the shadowgraph is used to measure shape and size... minimum and maximum tolerances. The shadowgraph is a projection, greatly magnified... on a calibrated screen... of the sample.

Schematic of shadowgraph



If you have a requirement for special steels—check with Crucible. Feel free to draw on the experience of our metallurgists and engineers. Crucible Steel Company of America, General Sales and Operating Offices, Oliver Building, Pittsburgh, Pa.

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### GAS-TURBINE . . . (continued from page 22)

main generators as motors. Energy will be absorbed in the compressor thus eliminating banks of resistors, used on diesel-electric locomotives for dynamic braking which will result in a considerable saving in weight.

#### Disadvantages

First, is the noise. Unfortunately, with the compressor drawing in air at about 20,000 cubic feet per minute and exhausting it at velocities up to 150 miles per hour it is practically impossible to muffle the noise. Mufflers tend to increase back pressure on the turbine and lower the output. Also, there is the high-pitched whine so typical of high-speed rotating machinery. Due to these noises it has been doubtful whether this type of locomotive would be acceptable in passenger service operating in and out of passenger stations.

Second, is low efficiencies. This is perhaps only a temporary disadvantage. It is expected, as stated before, that with development of materials that will stand up under high temperatures for long periods, efficiencies may exceed those of any other type of prime mover.

Third, is the large fuel losses at idling speeds. This characteristic will prevent the gas turbine from ever being economical for any use except, possibly, long-haul road work.

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# "Find Yourself" ... without losing time!

by FLOYD O. SMELTZ, Supervisor, Standardization Section  
WEST ALLIS WORKS (Graduate Training Course 1950) Ohio State—EE—1949

SELECTING a specific job in the engineering field after graduation from college is a tough proposition for most of us. It was for me, and that's why I came to Allis-Chalmers. I thought I wanted to be a development engineer but I wasn't sure. Allis-Chalmers Graduate Training Course gave me an opportunity of trying design and development—and other types of work also. By my own choosing I am now engaged in challenging work which I hadn't even



FLOYD O. SMELTZ

most fascinating science is coordinating engineering and production efforts through standardization of procedures, parts and materials. As Supervisor of the Standardization Section and Chairman of the Standards Committee, I encounter new problems every day—no monotony here.

But that is only part of the story! I am also Secretary of the Chief Engineers' Committee and Secretary of the Development and New Products Committee. What could be more stimulating for a young engineer than to be at the crossroads, where he can watch the engineering planning of an expanding company?

## No Limit to Opportunities

I never thought I'd be doing this when I graduated from Ohio State in 1949 and enrolled in Allis-Chalmers Graduate

Training Course. As I mentioned, I was particularly interested in design work at that time. In fact, right now there is a patent applied for on an electro-magnetic relay device I designed. Yes, they even let me do development work while still a GTC student.

A student helps plan his own courses and is free to change his plans as new interests, new opportunities present themselves. He can divide his time between shops and offices—switch to design, manufacturing, research, application engineering, sales, or advertising—and can earn advanced degrees in engineering at the same time.

When he graduates from the course he is encouraged to go into the type of work he liked best while on the Graduate Training Course.

One of the reasons Allis-Chalmers offers so many opportunities is that A-C designs and builds machines for every basic industry, such as: steam and hydraulic turbine generators, transformers, pumps, motors, rotary kilns, crushers, grinders, coolers, screens, and other machinery for mining, ore processing, cement, and rock processing. Then there are flour milling, electronic equipment and many others.

There is no other organization that seems to me to offer the graduate engineer such a wide range of activities, or that gives him such a chance to find the type of work for which he is best fitted.

# ALLIS-CHALMERS



Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin



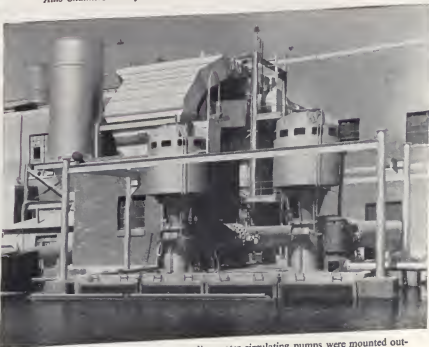
Allis-Chalmers car shaker empties coal and ore cars in minutes. Saves time . . . prevents injuries by keeping men out of car interiors.

considered while in school. The point is, all GTC's have the same chance of "finding themselves."

That's the outstanding feature of Allis-Chalmers Graduate Training Course. You have a very broad selection, and you yourself choose the type of training you receive. Of course you get help and guidance from experienced men throughout your training period. You need it, since there are jobs here that you have never dreamed of.

## Finds Job Challenging

Take my job for instance. To the engineering student it probably sounds rather dull when compared with Advanced Thermodynamics or Electric Transients in Power Systems. But, in my opinion, the



Weatherproof motors for condenser cooling water circulating pumps were mounted on doors to conserve valuable building space for a Texas utility.

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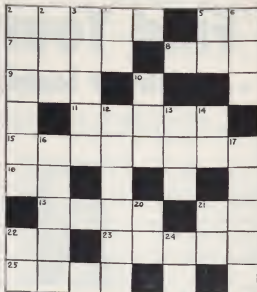
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### FOSTER'S QUIZ



#### ACROSS

- Pertaining to a cone
- Beryllium (chem. abbr.)
- Metallic element strongly attracted by magnets
- Block liquid obtained by distillation of coal, wood, etc.
- Clear profit
- Difference between observed and true value
- Second minus unity
- British Army Engineers (abbr.)
- Weights in a pile driver
- Bushel (abbr.)
- 5,280 feet (abbr.)
- Least whole numbers
- An isolated or protruding rock

#### DOWN

- Slag from a metal furnace
- Metal containing valuable metallic constituents
- Records in writing
- Inch (abbr.)
- Borium (chem. abbr.)
- Unit of energy
- Bow of light formed between two incandescent electrodes
- Measurer of temperature in  $^{\circ}$
- Preferred finished flooring
- Radian (chem. abbr.)
- Characterized by deficiency of moisture
- Assemblage of members forming a rigid framework
- Sanitary (abbr.)
- Baccalaureus Theologiae (abbr.)
- Master of Science (abbr.)
- Indium (chem. abbr.)

— Prepared by Freshman MATT FOSTER —

### GOOD LUCK GRADUATES!

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# All kinds of engineering jobs call for photography

Let's say you're going to engineer tomorrow's global transportation systems—explore inaccessible areas for new mineral deposits—or that you'll design a new machine or product. All along the engineering way, you'll find photography playing an important part.

Photography can help you choose a site through aerial photographs. It helps you analyze structural stresses by studies of plastic models in polarized light. It provides information on metal strength and structure through x-ray diffraction and photomicrography. It provides a rapid means of reproducing engineering drawings full-size—or reducing them to mere frames on microfilm for safe, easy storage and ready reference.

Applying photography to engineering and engineering to photography have become specialties in themselves. This has led graduates in the physical sciences and in engineering to find positions with the Eastman Kodak Company. If you are interested, write to Business and Technical Personnel Department, Eastman Kodak Company, Rochester 4, New York.

## **FUNCTIONAL PHOTOGRAPHY**

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*Section 96*

**Kodak**  
TRADE-MARK

WE ASKED GRADUATES TEN YEARS OUT OF COLLEGE:

# WHAT WOULD YOU SUGGEST TO MEN NOW PLANNING THEIR CAREERS?

This advertisement is another in a series written by G-E employees who graduated ten years ago—long enough to have gained perspective, but not too long to have forgotten the details of their coming with the Company. These graduates were sent a questionnaire which they returned unsigned. The quotes below represent only a sample of the suggestions received. For a free, mimeographed copy of the full list of comments, write to Dept. 221C-6, Schenectady, N. Y.

"The advice should go back to the sophomore level and it would be to take as many fundamental engineering courses as possible instead of specializing in one field during junior and senior years. The specialization will come as a matter of course due to participation in a phase of engineering occupation after graduation."

"Obtain working experience in all the jobs you think you know nothing about and avoid your primary interest the first year out of college. Ignore geographic location when selecting a job. Even Schenectady is an enjoyable place to live when you've been there long enough to know how to appreciate it. Respect and admire your boss or change bosses."

"Too many of today's graduates are hypnotized by the glamor fields of rockets, jets, etc., whereas they are overlooking good opportunities in the old standard lines."

"Come with G.E., take advantage of opportunity to find field of most interest and possible reward. Don't jump to any foregone conclusions, and don't hurry to find a 'permanent' job."

"This is for freshmen . . . Go to a school that will give you an excellent background in fundamentals of physics, math, mechanics, and materials. Spend at least 25 to 30% of your time in the study of humanities. Forget about machine shop and drawing courses and practical application. Get your practical experience eventually from a company. In a few years you will be worth 10 times more to them and yourself than the so-called practical student."

"Be thoroughly grounded in engineering fundamentals. Experiment in your likes and dislikes by trying several jobs. Work for a company that helps you do this."

"I think the General Electric Test Engineering Program is the ideal employment for the graduate engineer. He should spend the full time on Test with many assignments to obtain the background that will be of utmost value to him."

"Don't specialize too much. Get your fill of math, physics, and so-called liberal arts."

"Don't be afraid to change either training or vocation if you find you don't like it."

"Get a line of work in which you are sincerely interested; it should be a pleasure to get up and go to work in the morning."

"It is a rare thing, one to be cherished as a golden opportunity, to be able to move around on rotation, look over the best facilities and opportunities of a company and thereby be able to make a much more considered choice of where, finally, to work. These things are all possible on the G-E Test Course."

"The most pleasant life seems to be in the sales end of the business. This is what I would tell the college men to strive for if he is fitted for sales work."

"If you don't find your work interesting after five years or rewarded with responsibility and money after 10 years—quit."

"I have worked with hundreds of young fellows since I was on the Test program. Only a few of them knew exactly what they wanted a year or even two years after graduation. One advantage of working with a large company is that it gives them an opportunity to observe a broad field of activities—everything from beatrons to garbage disposers—locomotives to guided missiles. The most important thing in selecting a job is choosing one that will keep the individuals happy, contented and satisfied."

"Get with the company that offers the best training program—the longer the better."

"G-E Test is the best way to spend first 2 years after school—particularly if the graduate is undecided as to his field."

*You can put your confidence in—*  
**GENERAL  ELECTRIC**